South Carolina Department of Health and Environmental Control

ENVIRONMENTAL AFFAIRS

# SHELLFISH MANAGEMENT AREA 11

# 2020 ANNUAL UPDATE

**Shellfish Sanitation Section**
**Environmental Affairs**
**2600 Bull Street**
**Columbia, SC 29201**

**December 2020**

dhec
Healthy People. Healthy Communities.

**WEB ADDRESS**
**http://www.scdhec.gov/FoodSafety/ShellfishMonitoring/**

# SHELLFISH MANAGEMENT AREA 11
# 2020 ANNUAL UPDATE

## [ Data Through December 2019]

**Prepared By:**

Ryan Reed, Regional Shellfish Program Manager
Environmental Affairs - Office of Law Enforcement
1362 McMillan Avenue, Suite 300
Charleston, South Carolina 29405

**Reviewer:**

Mike Marshall, State Shellfish Program Manager
Environmental Affairs – Office of Law Enforcement
927 Shine Avenue
Myrtle Beach, South Carolina 29577

**TABLE OF CONTENTS**
**Shellfish Management Area 11 Annual Update**


Summary ..... 2
Introduction ..... 2
Pollution Source Survey ..... 6
Survey Procedures ..... 6
Point Source Pollution ..... 7
A. Municipal and Community Waste Treatment Facilities ..... 7
B. Industrial Waste ..... 10
C. Marinas ..... 11
D. Radionuclides ..... 12
Non-point Source Pollution ..... 12
A. Urban and Suburban Stormwater Runoff ..... 12
B. Agricultural Runoff ..... 13
C. Individual Sewage Treatment and Disposal Systems ..... 13
D. Wildlife and Domestic Animals ..... 13
E. Boat Traffic ..... 13
F. Hydrographic and Habitat Modification ..... 14
Naturally Occurring Pathogens ..... 14
A. Marine Biotoxins ..... 14
B. *Vibrio parahaemolyticus* ..... 14
Hydrographic and Meteorological Characteristics ..... 14
Water Quality Studies ..... 15
Conclusions ..... 17
Recommendations ..... 17
References ..... 19


**Figures and Tables**

**Figures:**


(1) Shellfish Growing Area 11 ..... 20


**Tables:**


(1) Shellfish Water Quality Sampling Stations Description ..... 21
(2) Fecal Coliform Bacteriological Data Summary Sheet
*(January 01, 2017 - December 31, 2019)* ..... 22
(3) Fecal Coliform Historical Trend Sheet ..... 23
(4) Water Quality Sampling Station Data ..... 24
(5) Rainfall Data *(January 01, 2017 - December 31, 2019)* ..... 25
(6) Pollution Event Closures ..... 29
(7) Marinas ..... 30

**2020 ANNUAL UPDATE**
**Shellfish Management Area 11**

**Data Inclusive Dates:**
01/01/17 thru 12/31/19

**Classification Change:**
X Yes ___ No

**Shoreline Survey Completed:** Yes

**(I)ncreased/(D)ecreased/(N)one:**
I Approved
N Conditionally Approved
D Restricted
N Prohibited

**Prior Report & Date:** 2019 Annual Update

## SUMMARY

Upland shores along the northern part of the Stono River, as well as along Bass Creek, Cinder Creek and Kiawah River all are being heavily developed, bacteriological water quality in Shellfish Management Area 11 (SFMA 11) appears to be directly affected. Annual water quality oscillations, primarily rainfall-induced, appears to directly affect the management area. One classification change will be implemented for the upcoming 2020-2021 shellfish harvesting season. The Restricted areas on the Stono River from Station 11-05 to Station 11-33 including all of Sol Legare landing will now be upgraded to Approved for the upcoming season except the southwest sections to from Stations 11-06 and 11-06A. The waters of Cinder Creek and adjacent marshlands, extending from Station 11-34 to Station 11-32 will continue to be restricted and will extend on Bass Creek to the Stono River at Station 11-31.

During the past several years this area has been impacted by major storms. In September of 2019, Hurricane Dorian produced 5.74 inches of rainfall during a two-day period. In October of 2016, heavy rains and wind associated with Hurricane Matthew impacted the area. Area 11 received excessive amounts of rain during the storm event, which resulted in a required closure and subsequent sampling to reopen the area. Area 11 was also impacted on September 12, 2017 from heavy rains and wind associated with Hurricane Irma. Area 11 received 8.06 inches of rain during the storm event, which resulted in a delayed opening of the 2017 Shellfish Season and special sampling was required prior to opening the area.

On February 27, 2018, the Charleston Harbor south to the North Edisto River including all areas of Area 11 were closed due to a force main break in the Town of Hollywood's sewer line. Those areas were reopened on March 20, 2018.

## INTRODUCTION

### PURPOSE AND SCOPE

The authority to regulate the harvest, sanitation, processing, and handling of shellfish is granted to the South Carolina Department of Health and Environmental Control by Section 44-1-140 of the Code of Laws of South Carolina, 1976, as amended. The Department promulgated Regulation 61-47, which provides the rules used to implement this authority and outlines the requirements applied in regulating shellfish sanitation in the State. This regulation specifically addresses classification of shellfish harvesting areas and requires that all areas be examined by sanitary and bacteriological surveys and classified into an appropriate shellfish harvesting classification.

The United States Food and Drug Administration (USFDA) uses The National Shellfish Sanitation Program's (NSSP) *Guide for the Control of Molluscan Shellfish* to evaluate state shellfish sanitation programs. The NSSP Model Ordinance requires that a sanitary survey be in place for each growing area prior to its use as a source of shellfish for human consumption and prior to the area's classification as Approved, Conditionally Approved, Restricted, or Conditionally Restricted. Each sanitary survey shall be updated on an annual basis and accurately reflect changes which have occurred within the area. Requirement of the annual reevaluation include, at a minimum, field observations of pollution sources, an analysis of water quality data consisting of the past year's data in combination with appropriate previously collected data, review of reports and effluent samples from pollution sources, and review of performance standards for discharges impacting the growing area. A brief report documenting the findings shall also be provided.

The following criteria consistent with the NSSP Model Ordinance and S. C. Regulation 61-47 are used in establishing shellfish harvesting classifications:

**Approved Area -** Growing areas shall be classified approved when the sanitary survey concludes that fecal material, pathogenic microorganisms, and poisonous or deleterious substances are not present in concentrations that would render shellfish unsafe for human consumption. Approved classifications shall be determined upon a sanitary survey that includes water samples collected from stations in the designated area adjacent to actual or potential sources of pollution. For waters sampled under adverse pollution conditions, the median fecal coliform Most Probable Number (MPN) or the geometric mean MPN shall not exceed fourteen per one hundred milliliters, nor shall more than ten percent of the samples exceed a fecal coliform MPN of forty-three per one hundred milliliters (per five tube decimal dilution). For waters sampled under a systematic random sampling plan, the geometric mean fecal coliform MPN shall not exceed fourteen per one hundred milliliters, nor shall the estimated ninetieth percentile exceed an MPN of forty-three per one hundred milliliters (per five tube decimal dilution). Computation of the estimated ninetieth percentile shall be determined using National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish methodology.

**Conditionally Approved Area -** Growing areas may be classified conditionally approved when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in non-point source pollution from rainfall runoff or discharge of a major river, a management plan describing conditions under which harvesting will be allowed shall be adopted by the Department prior to classifying an area as conditionally

approved. Where appropriate, the management plan for each conditionally approved area shall include performance standards for sources of controllable pollution (e.g., wastewater treatment and collection systems), evaluation of each source of pollution, and means of rapidly closing and subsequently reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate. Shellfish shall not be directly marketed from a conditionally approved area until conditions for an approved classification have been met for a period of time likely to ensure the shellfish are safe for consumption. Shellstock from conditionally approved areas that have been subjected to temporary conditions of actual or potential pollution may be relayed to approved areas for purification or depurated through controlled purification operations only by special permit issued by the Department.

**Restricted Area** - Growing areas shall be classified restricted when sanitary survey data show a moderate degree of pollution or the presence of deleterious or poisonous substances to a degree that may cause the water quality to fluctuate unpredictably or at such a frequency that a conditionally approved classification is not feasible. Shellfish may be harvested from areas classified as restricted only for the purposes of relaying or depuration and only by special permit issued by the Department and under Department supervision. The suitability of restricted areas for harvesting of shellstock for relay or depuration purposes may be determined through the use of comparison studies of background tissue samples with post-process tissue samples, as well as other process verification techniques deemed appropriate by the Department. For restricted areas to be utilized as a source of shellstock for depuration, or as source water for depuration, the fecal coliform geometric mean MPN of restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters nor shall more than ten percent of the samples exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters nor shall the estimated ninetieth percentile exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish methodology.

**Conditionally Restricted Area** - Growing areas may be classified conditionally restricted when they are subject to temporary conditions of actual or potential pollution. When such events are unpredictable, as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be prepared by the Department prior to classifying an area as conditionally restricted. Where appropriate, the management plan for each conditionally restricted area shall include performance standards for sources of controllable pollution, e.g., wastewater treatment and collection systems and an evaluation of each source of pollution, and description of the means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate. Shellfish may be harvested from areas classified as conditionally restricted only for the purposes of relaying or depuration and only by permit

issued by the Department and under Department supervision. For conditionally restricted areas to be utilized as a source of shellstock for depuration, the fecal coliform geometric mean MPN of conditionally restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters nor shall more than ten percent of the samples exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters nor shall the estimated ninetieth percentile exceed an MPN of two hundred and sixty per one hundred milliliters (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish methodology.

**Prohibited Area** - Growing areas shall be classified prohibited if there is no current sanitary survey report or if the sanitary survey report or monitoring data show unsafe levels of fecal material, pathogenic microorganisms, or poisonous or deleterious substances in the growing area or otherwise indicate that such substances could potentially reach quantities that could render shellfish unfit or unsafe for human consumption.

## BACKGROUND INFORMATION

This sanitary survey evaluates the current harvesting classification of shellfish growing waters designated as Shellfish Management Area 11 (Area 11). Area 11 consists of approximately 29,273 acres of shellfish growing area habitat located in Charleston County, South Carolina. Area 11 consists of the Stono River and its tributaries including Elliott Cut, Abbapoola, Bass, Cinder, Green, Log Bridge and Rantowles Creeks and a portion of New Cut as well as the Kiawah River and its tributaries including Bryans, Captain Sams and Mullet Hall Creeks.

The shellfish industry in South Carolina is based primarily on the harvest of the eastern oyster (*Crassostrea virginica*) and hard clams, which include both the northern clam (*Mercenaria mercenaria*) and several small populations of the southern clam (*Mercenaria campechiensis*). The ribbed mussel (*Geukensia demissa*) is also harvested in South Carolina, primarily on a small scale by the general public for recreational harvest. Areas in South Carolina designated for commercial harvest by the South Carolina Department of Natural Resources (SCDNR) include State shellfish grounds, Culture permits, Mariculture Permits, and Kings Grant areas.

There are four (4) State Shellfish Grounds (S) within Area 11: S172, S194 East, S194 West, and S189. There are two (2) Recreational Shellfish Grounds (R): R186 and R193. There are nine (9) Culture Permits (C) and one (1) Mariculture Permit lease throughout the southern portion of the area. There is also one (1) Grant (G) within Area 11: G170.

The wild-stock shellfish harvesting season in South Carolina extends from October through May of the following year. The SCDNR has the authority to alter the shellfish-harvesting season for resource management purposes and grant permits for year-round mariculture operations. Additionally, the South Carolina Department of Health and Environmental Control has the authority to prohibit shellfish harvesting when necessary to ensure that shellfish harvested in South Carolina waters are safe for human consumption.

The harvesting classification of Area 11 **prior** to this sanitary survey was as follows:

**PROHIBITED**

1. Those waters of Elliott Cut and Wappoo Creek and all adjacent marshland;
2. Those waters of the Stono River approximately 1,000 feet south and 1,000 feet north of the St. Johns Yacht Harbor;
3. Those waters within approximately 1,000 feet of the Ross Marine facility.

**RESTRICTED**

1. Those waters of the Stono River and adjacent marshlands, extending from Station 12B-01 to Station 11-15;
2. Those waters of New Cut Creek and adjacent marshlands, extending from 11-15 to 12A-41;
3. Those waters of Abbapoola Creek and adjacent marshlands, from its headwaters to the Stono River down to Station 11-33 including all of Sol Legare landing and southwest back to Station 11-06;
4. Those waters of Bass Creek and adjacent marshlands, from its headwaters to Station 11-31 at the confluence with the Stono River;
5. Those waters of Cinder Creek and adjacent marshlands, from its headwaters to the confluence with Bass Creek.

**CONDITIONALLY APPROVED**

None

**APPROVED**

All other waters in Area 11.

**Station Additions/Deactivations/Modifications:** None

## POLLUTION SOURCE SURVEY

### SURVEY PROCEDURES

Shoreline surveys of Area 11 are conducted by the South Carolina Department of Health and Environmental Controls, Environmental Affairs, Lowcountry – Charleston Shellfish Sanitation Program staff**,** by watercraft, vehicle, and on foot, during the survey period and are ongoing. Previous shoreline survey efforts conducted by the Office of Coastal Resource Management (OCRM) as well as the thermal imaging project will continue to be documented.

OCRM developed GIS shapefiles documenting rural, non-MS4 (Municipal separate storm sewer system) areas in Charleston County on septic tanks. A one-mile buffer was drawn around all impaired shellfish water bodies in the county. County parcel data was cross referenced with Department septic tank permit data in those areas to develop shapefiles of all parcels on septic tanks, to include the number of tanks on the property and the property owner's names(s) and address(s). A physical shoreline survey of these same areas was conducted, taking GPS coordinates of any observed animal farms, to include the parcel information of the farm, the type and number of animals observed, and their distance from shellfish harvesting waters. Together, the septic data and animal farm data should provide information for future shoreline survey efforts in locating and evaluating potential non-point source impacts near impaired shellfish harvesting waters.

**POINT SOURCE POLLUTION**

## A. Municipal and Community Waste Treatment Facilities

There are two wastewater treatment plants (WWTP) within Area 11 that have been issued land application permits. One is issued to Kiawah Island Utility (ND0017361) on Kiawah Island. The other is issued to the Town of Seabrook Island (ND0063347) on Seabrook Island.

| National Pollutant Discharge Elimination System (NPDES) Permitted Facilities | | | |
|---|---|---|---|
| **Permit #** | **Facility** | **Outfalls** | **Permitted Flow (Gallons Per Day)** |
| ND0017361<br>43 FC/100 ml | Kiawah Island Utility – WWTP | 001-006 – Land App. To Golf Course | 859,015 GPD |
| ND0063347 | Town of Seabrook Island – WWTP | 001-003 - Land App. to Golf Course | 869, 200 GPD |
| SC0048186 | Kiawah Resort / Cassique Golf – Reverse Osmosis | 001-Unnamed Trib. to Kiawah River | N/A |

There is also a Reverse Osmosis (RO) plant located within Area 11 issued to Kiawah Resort\Cassique Golf Course (SC0048186) on Seabrook Island. The discharge is only permitted to discharge concentrated salt residue. The Town of Kiawah had no reported SSO's for 2017-2019. Also, the Town of Seabrook had no reported SSO's for 2017-2019.

| Sanitary Sewer Overflows | | | | |
|---|---|---|---|---|
| **Town of Kiawah & Town of Seabrook – 2017-2019** | | | | |
| **Date** | **Location** | **Gallons** | **Water Body** | **Comments** |
| N/A | N/A | N/A | N/A | N/A |

These three facilities are depicted on the attached Potential Pollution Source Map. The tables below summarizes all instances where WWTP facilities exceeded their allowed permit values for fecal coliform, the Discharge Monitoring Report (DMR) value of that violation, and flow value. For the 2017-2019 reporting years for this Annual Update,

there were six instances of permit violation for fecal coliform parameters.

| WWTP Discharge Monitoring Report Violations 2016-2018 | | | | | |
|---|---|---|---|---|---|
| **Facility** | **Limit** | **Violation** | **Outfall** | **Report Date** | **Monthly Avg. Flow (Gallons Per Day)** |
| Kiawah Island - WWTP | 14 FC/100 ml | 2420 FC/100ml | 001 | October 2019 | 0.47 MGD |
| | 43 FC/100 ml | 2420 FC/100ml | 001 | October 2019 | 0.47 MGD |

The City of Charleston has a wastewater collection system in Area 11, operated by Charleston Water Systems. It services the incorporated parts of the City of Charleston, including portions of James Island, Johns Island, and West Ashley. Charleston Water Systems also services the St. Andrews PSD in West Ashley. James Island PSD and the Town of Hollywood have their own satellite wastewater collection systems in Area 11. The Plum Island WWTP (SC0021229), operated by Charleston Water Systems, receives wastewater from all these collection systems. Plum Island is located on the Ashley River adjacent to Dill Creek, and discharges treated wastewater into the Charleston Harbor (Area 10B). Charleston Water Systems, St. Andrews PSD, and James Island PSD reported forty-two (42) sanitary sewer overflows (SSO's) for 2017-2019. The town of Hollywood had four (4) reported SSO's for 2017-2019.

| Sanitary Sewer Overflows – 2017-2019 | | | | |
|---|---|---|---|---|
| **Hollywood** | | | | |
| **Date** | **Location** | **Gallons Released** | **Waterbody Entered** | **Comments** |
| 2/19/2018 | Old Charleston Rd. near junction of Hwy 17 | 2,400,000 | Unnamed creek into Stono River | All Growing Areas south of Charleston Harbor |
| 3/23/2018 | Old Charleston Rd. near junction of Hwy 17 | 40,000 | N/A | 11 |
| 8/12/2018 | PS # 6 | 2,000 | N/A | 11 |
| 12/30/2019 | Manhole 5 | 350 | N/A | 11 |
| **Chas Water Systems/St. Andrews PSD/James Island PSD** | | | | |
| **Date** | **Location** | **Gallons Released** | **Waterbody Entered** | **Comments** |
| 4/27/2017 | Stono Watch Drive | 1,500 | Marsh of Stono River | 11 |
| 6/10/2017 | 40 Boardman Rd. | 1,200 | Orangegrove Creek to Ashley River | 10B |
| 7/12/2017 | 2265 Clement Ferry | 3,450 | Storm Drain | 9B |
| 7/24/2017 | Lyttleton & Nicholson | 6,000 | Wappoo Cut | 11 |
| 7/24/2017 | 1575 Dowden Ct. | 2,400 | Oldtown Creek to Ashley River | 10B |
| 8/3/2017 | 55 Beverly Drive | 360 | Greenway to Ashley River | 10B |

| | | | | |
|---|---|---|---|---|
| 8/3/2017 | Lyttleton & Nicholson | 4,800 | Wappoo Cut to Ashley River | 10B |
| 12/16/2017 | Riverland Dr. & Camp Rd. | 5,100 | James Island Creek | 11/10B |
| 5/1/2018 | Arv G-01 Located At A Creek Crossing Along West Ashley Greenway Near Archdale Drive | 5 | Small Tidal Creek Leading To Stono River | 11 |
| 7/20/2018 | 2 Oakdale Place- West Ashley | Unknown | Marsh Landing To The Ashley River | 10B |
| 7/20/2018 | 1127 Donahue Dr - West Ashley | Unknown | Sw Pond To Marsh To Ashley River | 10B |
| 7/20/2018 | 1571 Dowden Court - West Ashley | Unknown | Ditch To The Marsh Then To The Ashley River | 10B |
| 7/20/2018 | 2 Lyttleton Ave - West Ashley | Unknown | Marsh To Wappoo. Cut To Ashley River | 10B |
| 7/20/2018 | 790 Woodard Rd - West Ashley | Unknown | Marsh Leading To Ashley River | 10B |
| 7/20/2018 | 49 & 55 Beverly Rd - West Ashley | 3,600 | Possibly To The Ashley River | 10B |
| 7/24/2018 | Manhole Near Intersection Of Lyttleton And Nicholson - West Ashley | 6,000 | Marsh Leading To Wappoo Court To Ashley River | 10B |
| 7/25/2018 | 1575 Dowden Court- West Ashley | 2,400 | Discharge To Ditch Leading To Marsh Of Ashley River | 10B |
| 7/30/2018 | 1127 Donahue Dr - West Ashley | 5,400 | Stormwater Pond To Marsh Ashley River | 10B |
| 9/9/2018 | 1781 Harmony St West Ashley | 8,400 | N/A | 10B |
| 10/11/2018 | Lyttleton Ave At Nicholson St West Ashley | 13,200 | Marsh Leading To Wappoo Cut To Ashley River | 10B |
| 10/11/2018 | Hwy 61 & Hwy 17 Pump By Round Holiday Inn | 500 | Ashley River Via Strom Drain | 10B |
| 10/11/2018 | William Ackerman Lane At Charkestowne Rd West Ashley | 6,600 | Marsh Leading To Wappoo Cut To Ashley River | 10B |
| 12/9/2018 | 137 Donahue Dr | 1,800 | Sw Pond To Marsh To Ashley River | 10B |
| 12/9/2018 | Lyttleton At Nicholson | 21,600 | Marsh To Wappoo Cut To Ashley River | 10B |
| 12/9/2018 | 55 Beverly Rd | 3,600 | Possibly To The | 10B |

| | | | | |
|---|---|---|---|---|
| | | | Ashley River | |
| 12/9/2018 | 598 A Windemer Rd | 7,200 | N/A | 10B |
| 12/10/2018 | 501 Stinson Sr | 1,500 | N/A | 10B |
| 12/14/2018 | 55 Beverly Rd West Ashley | 4,500 | Possibly To The Ashley River | 10B |
| 12/14/2018 | 1127 Donahue Dr West Ashley | Unknown | Storm Water Pond To Marsh To Ashley River | 10B |
| 12/14/2018 | Lyttleton Ave At Nicholson St West Ashley | Unknown | Marsh Leading To Wapoo Cut To The Ashley River | 10B |
| 12/14/2018 | South Windemere Rd At William Ackerman Lane West Ashley | 10,800 | Marsh Leading To Wapoo Cut To The Ashley River | 10B |
| 7/8/2019 | 2235 Ashley River Rd near Ashley Crossing Ln – West Ashley | 1,000 | N/A | 10B |
| 8/14/2019 | 2169 Harborview Rd, James Island | | Marsh near James Island Creek | 10B |
| 11/17/2019 | Lyttleton Ave – West Ashley | 2,400 | N/A | 10B |
| 11/17/2019 | South Windermere Rd at William Ackerman Ln- West Ashley | 15,000 | N/A | 10B |
| 11/19/2019 | Marsh near the intersection of I-526 West and Clements Ferry Rd | 3,500 | Marsh adjacent to Cooper River | 10B |
| 12/23/2019 | Charleston CPW Plum Island – Manhole 39-247 | 2,460 | N/A | 10B |
| 12/23/2019 | Charleston CPW Plum Island – Manhole X-01 | 4,050 | N/A | 10B |
| 12/23/2019 | Charleston CPW Plum Island – Manhole 39 | 4,440 | N/A | 10B |
| 12/24/2019 | Charleston CPW Plum Island – Manhole 11-01 | 2,910 | N/A | 10B |
| 12/24/2019 | Charleston CPW Plum Island - Manhole L1 04 | 4,500 | N/A | 10B |
| 12/24/2019 | Charleston CPW Plum Island – Manhole CC-22 | 2,100 | N/A | 10B |

B. **Industrial Waste (Discharges)**

There are twelve permitted industrial wastewater discharges located within the boundary of Area 11 (see Table below). There are four (SCG731015, SCG731016, SCG730126 and SCG730353) that are located outside the Area but are still within the watersheds of Logbridge and Rantowles creeks. All sixteen permits are for mineral mine dewatering,

issued to address dewatering of excavated sand pits/granite mines. Their discharges are depicted on the attached Potential Pollution Source map (Figure 1).

| National Pollutant Discharge Elimination System (NPDES) Permitted Facilities | | |
|---|---|---|
| **Permit #** | **Facility Name** | **Facility Type** |
| SCG730355 | Sunnyside Farms / Canal Bridge | Industrial-Discharge-Mine Dewatering |
| SCG730681 | Massenburg Const / Bedrock | Industrial-Discharge-Mine Dewatering |
| SCG730083 | Three Oaks/Chicken Farm | Industrial-Discharge-Mine Dewatering |
| SCG730617 | Charleston Co. / Kinsey-Blake | Industrial-Discharge-Mine Dewatering |
| SCG730374 | W Frazier Const. / Murray Woods Pt. | Industrial-Discharge-Mine Dewatering |
| SCG730126 | W Frazier Const. / Ravenel | Industrial-Discharge-Mine Dewatering |
| SCG730139 | Murray Sand / Dungannon Pit | Industrial-Discharge-Mine Dewatering |
| SCG730353 | Rogers and Sons / Ravenwood | Industrial-Discharge-Mine Dewatering |
| SCG730983 | Paul D. McCraw / Brownswood | Industrial-Discharge-Mine Dewatering |
| SCG731015 | Palmetto Grading & Drainage / Hyde #1 | Industrial-Discharge-Mine Dewatering |
| SCG731016 | Palmetto Grading & Drainage / Hyde #2 | Industrial-Discharge-Mine Dewatering |
| SCG731050 | County Line Investors / Poplar Grove Tract B Mine | Industrial-Discharge-Mine Dewatering |
| SCG731004 | Murray Sand Co. / Woodland | Industrial-Discharge-Mine Dewatering |
| SCG731001 | Dirt Supply Inc. / Bluemel Mine | Industrial-Discharge-Mine Dewatering |
| SCG731009 | D.H. Hankins Trucking Co. | Industrial-Discharge-Mine Dewatering |
| SCG731036 | James O'Neal / Legareville Mine | Industrial-Discharge-Mine Dewatering |

**C.** **Marinas** – In 2007, prompted by a SCDHEC Office of Coastal Resource Management (OCRM) marina definition change, SCDHEC Shellfish adopted the following marina definition. S.C. Regulation 61-47, Shellfish defines *Marina* as any of the following: 1) locked harbor facility; 2) any facility which provides fueling, pump-out, maintenance or repair services (regardless of length); or, 3) any facility which has permanent docking space of 250 linear feet or greater. 4) Any water area with a structure which is used for docking or otherwise mooring vessels and constructed to provide temporary or permanent docking space for more than ten boats. 5) A dry stack facility. The Department is currently in the process of identifying all facilities meeting the new marina definition. Once identified, they will be mapped and adequate closure zones established to protect public health.

Prior to the 2007 definition change, there were two marinas in Area 11. One is St. Johns

Yacht Harbor, a large recreational marina on the Stono River adjacent to Maybank Highway. Permitted in 2007, St. Johns Yacht Harbor combined the former Buzzards Roost Marina and Stono Marina into a single, large marina. As originally permitted, it was to be built with 322 finger pier slips, side-tie moorage for 21 boats, and 61 boatlifts, accommodating boats from 26 to 100+ feet in length. However, at this time only the Buzzards Roost portion has been rebuilt. It consists of 230 boat slips and 61 boatlifts, offering fuel and sewage pump-out services, including a sewage pump-out boat. Ten live-aboards are currently present at St. John's Yacht Harbor. Completion of the Stono Marina portion of the project is on hold at present time due to the economy. A closure zone is in place, extending approximately 1,000 feet south to approximately 1,000 feet north of St. Johns Yacht Harbor. Additionally, Ross Marine is a small boat repair facility located on the Stono River, totaling 1,416 linear feet of dockage and holding approximately 15 boats. It is primarily a recreational boat repair facility, whose dockage is used for boats awaiting haul-out for land-based repair. It offers diesel fuel service to the public and has gasoline for facility use. There are no sewage pump-out services at Ross Marine. It has a permit in-hand to expand the facility to add dry-stack storage, however those plans for expansion are currently on hold due to the economy. A closure zone is in place extending approximately 1,000 feet from the Ross Marine facility. Table #7 is included at the end of this report, providing additional detail on Area 11 boating facilities.

**D.** **Radionuclides** - Sources of radionuclides have not been identified within Area 11, and radionuclide monitoring has not been conducted. No other sources of poisonous or deleterious substances have been identified within the area.

**NONPOINT SOURCE POLLUTION**

**A.** **Urban and Suburban Stormwater Runoff** - Previous shoreline surveys conducted in Area 11 revealed the highest concentration of homes to be along the Stono River around Elliott Cut. The remaining portions of the Stono and the Kiawah Rivers have single-family residences along the shoreline. Residential construction continues at a rapid rate, along the Stono River from Limehouse Bridge south to Goshen Point, and along both Bass and Cinder Creeks.

The Stono and the AIWW require routine maintenance dredging by The Army Corps of Engineers. The Army Corps of Engineers has not conducted any dredging activities in the area recently.

The uplands surrounding the shellfish growing waters of Area 11 consist of various soil textures. The United States Department of Agriculture (USDA), Soil Conservation Service (Charleston Co.1971) utilizing general classifications and descriptions, has defined these soils. Although lands within Area 11 consist of numerous soil types, the area is generally comprised of Yonges-Hockley-Edisto soils made up of low broad plains, which are randomly spaced drainage-ways that lead to tidal streams. The USDA (1971) further describes these soils as moderately well drained to poorly drained, nearly level soils that have a sandy surface layer and predominantly loamy subsoil.

**B.** **Agricultural Runoff** - There are no permitted agricultural facilities located in Area 11. Previous shoreline surveys found a significant amount of pasture and farmland throughout Johns Island. The Clemson Extension Station located on U.S. Highway 17 utilizes various types of crop fertilizers on their property for research purposes.

**C.** **Individual Sewage Treatment and Disposal Systems** - In Area 11, the southern half of Johns Island is entirely served by individual septic systems. Public sewer also does not serve the area west of Main Road. There are sporadic septic tanks on Kiawah Island, mostly along the eastern end of the island. There are also septic tanks serving portions west of the Upper Stono, outside of Hollywood town limits, which drain to Logbridge Creek, Rantowles Creek and the Stono River. Each system is required to be inspected by South Carolina Department of Health and Environmental Control's, Environmental Affairs, Bureau of Environmental Health Services Lowcountry-Charleston, On-site Wastewater Section, and approved before final installation.

**D.** **Wildlife and Domestic Animals** - Area 11 supports a large population of domestic animals attributable to the number of private residences along its shores. There are many small tidal creeks throughout the Area. This creek system provides a conduit for animal fecal coliform bacteria to be transported to the adjacent growing waters.

There are limited amounts of wildlife on James Island and Johns Island due to the amount of urban and suburban development on James Island and cultivated/pasture lands of Johns Island. An elaborate wildlife management program exists throughout Kiawah Island, including an intensive deer population control project. A lake and pond system on Kiawah Island consists of 116 freshwater and brackish ponds, many of which ultimately drain into Bass and Cinder Creek. The large wildlife populations on Kiawah Island make them a likely contributor to fecal coliform levels in the area. Information on Kiawah Island's lake management system can be found at the following web address:

http://kica.us/about/departments/maintenance/

Bird Key - Stono Heritage Preserve is a DNR managed heritage preserve, a sandpit island formed in the mouth of the Folly and Stono River. The preserve provides nesting, roosting and foraging habitat for a variety of sea and shore birds. Beginning in the mid-1980's, thousands of eastern brown pelicans, several species of terns, black skimmers, laughing gulls, two species of herons and other incidental species successfully nested on Bird Key Stono every year. Due to bird nesting activity, this Preserve is closed to public use from March 15 thru October 15. (Source: https://www.dnr.sc.gov/mlands/lookup/ ). Bird Key is a likely contributor to fecal coliform levels in the area during that time; however, those levels are likely mitigated by Bird Key's proximity to Stono Inlet and the immediate ocean water tidal flushing ocean inlets provide.

**E.** **Boat Traffic** - Recreational boat traffic is moderate throughout the year. Commercial fisheries boats, ranging in size from 16 to approximately 50 feet, operate in the area in accordance with product demand. The northern portion of the Stono River (from Goshen

Point to Elliott Cut) is part of the AIWW. The waterway supports most of the recreational boat traffic.

**F.** **Hydrographic and Habitat Modification** - Hydrographic and habitat modification in estuarine areas requires both State and Federal approval. Portions of the Stono and the AIWW require maintenance dredging. The United States Army Corps of Engineers utilizes designated tracts of land adjacent to the AIWW as dredge spoil sites.

### NATURALLY OCCURRING PATHOGENS

**A.** **Marine Biotoxins** - Bivalve shellfish contamination from marine biotoxins has not been shown to be a human health concern within Area 11. During the winter and spring of 1988, South Carolina experienced an occurrence of "Red Tide", specifically Ptychodiscus brevis (K. brevis), which affected water quality in Area 01. There have been no documented reoccurrences of this organism at levels requiring emergency response in South Carolina waters subsequent to the 1988 event. Due to the vast media coverage of events related to Pfiesteria pisicida, the Department participates in a State Task Group on Toxic Algae and operates a toxic algae emergency response team.

**B.** ***Vibrio Parahaemolyticus*** – Because State water temperatures exceed 81 degrees Fahrenheit (F) during June through September, *Vibrio parahaemolyticus* (Vp) management controls must be implemented during these months. Management controls for permitted Aquaculture facilities are specifically addressed in R.61-47. The season for wild-stock harvest is currently closed from May 16 through September 30. The Department is currently opposed to issuance of special wild-stock harvest permits to Certified Shippers during the closed season. Special permit conditions for maricultured triploid oysters during the vibrio control months must include current R.61-47 and NSSP temperature control requirements to be included in the Certified Shipper's HACCP plan.

## HYDROGRAPHIC AND METEOROLOGICAL CHARACTERISTICS

### PHYSIOGRAPHY

Area 11 consists of the Stono River and its tributaries including Elliott Cut, Abbapoola, Green, Hut, Log Bridge and Rantowles Creek and a portion of New Cut as well as the Kiawah River and its tributaries including Bass, Bryans, Captain Sams, Cinder and Mullet Hall Creeks. Due to minimal shoaling in both the Stono and Kiawah Rivers, dredging occurs on an infrequent basis. Freshwater can flow into the area thru Elliott Cut from the Ashley River; however, most freshwater enters the area by way of overland runoff from rainfall events. High salinity ocean water enters the area from the Stono Inlet at the southeast corner of the area and Captain Sam's Inlet, which is shared by Kiawah and Seabrook Islands at the southwest corner of the area. The entire area is approximately 16 miles wide (west to east) and 19 miles long (north to south).

Tides in Area 11 are semidiurnal, consisting of two low and two high tides occurring each lunar day. Mean tidal ranges in the Stono River at Elliott Cut are 5.2 feet during normal tides and 6.8 feet during spring tides. Wind direction and intensity, as well as atmospheric pressure, typically cause variations in predicted tidal ranges.

Precipitation in Area 11 is heaviest during late summer and early autumn. Tropical storms and hurricanes occasionally produce extremely large amounts of rainfall. During winter months heavy rainfall events are uncommon, yet occasional intense thunderstorms associated with rapid moving low-pressure systems generate heavy rains. Precipitation rarely occurs in the form of snow or ice. Spring weather patterns may be dynamic with associated thunderstorms and severe weather conditions.

In 2017, the collection of rainfall data has been improved for a more consistent, accurate, and reliable data set that can be accessed directly from a shellfish staff member's computer or phone. With assistance from the National Weather Service's, Southeastern River Forecast Center, the development of the South Carolina Shellfish Rainfall Program was introduced and utilized. This new technology provides shellfish program staff with real-time daily updates for rainfall accumulation in each of the South Carolina shellfish growing management areas, as well as providing critical triggers that alert staff to when rainfall thresholds for closures are exceeded.

In September of 2019, Hurricane Dorian produced 5.74 inches of rainfall during a two-day period. On October 8, 2016, Hurricane Matthew made landfall southeast of McClellanville, SC. Shellfish harvest was closed by SC DHEC prior to the arrival of the storm. Hurricane Matthew dropped considerable amounts of precipitation in the Charleston area and had a storm surge that caused extensive flooding. SC DHEC reassessed the closures after the storm and conducted sampling prior to reopening the growing areas. Water sampling was used to reopen the beds once fecal coliform concentration levels were low enough to permit harvest. The widespread flooding also caused sanitary sewer overflows into harvestable shellfish areas, requiring 21-day closures and additional tissue samples prior to reopening. On September 12, 2017, Hurricane Irma passed over Charleston, SC causing significant flooding with 8.06 inches of rain in Area 11 and a 9.9 foot high tide in Charleston. The 2019 precipitation total recorded for Area 11 was 49.17 inches.

Prevailing winds along the central portion of the South Carolina coast are from the south and west during spring and summer and from the north during autumn and winter. Wind speeds are generally less than 15 miles per hour (mph); however, strong weather systems may generate winds in excess of 25 mph. Tropical storms and hurricanes occasionally occur.

Freshwater rivers do not discharge directly into Area 11. Freshwater can flow into the area thru Elliott Cut from the Ashley River; however, most freshwater influence is primarily due to rainfall and associated runoff.

## WATER QUALITY STUDIES

### DESCRIPTION OF THE PROGRAM

The Department currently utilizes a systematic random sampling (SRS) strategy within Area 11 in lieu of sampling under adverse pollution conditions. In order to comply with NSSP guidelines, a minimum of thirty samples are required to be collected and analyzed from each station during the review period. Sampling dates are computer generated prior to the beginning of each quarterly period thereby insuring random selection with respect to tidal stage and weather. Day of week selection criteria is limited to Mondays, Tuesdays and Wednesdays due to shipping requirements and laboratory manpower constraints. Sample schedules are rarely altered. During July 1998, an updated shellfish water quality data scheduling and collection procedure was formalized. Samples utilized for classification purposes are limited to those samples collected in accordance with the SRS for a 36-month period beginning January 1 and ending December 31. This allows for a maximum of 36 samples per station, yet provides a six-sample cushion (above the NSSP required 30 minimum) for broken sample bottles, lab error, breakdowns, etc. This also allows each annual report's water quality data to meet the requirements for the NSSP Triennial Review sampling criteria.

Nine hundred and ten (910) SRS routine surface water quality samples (<1.0 ft deep) were collected for bacteriological analyses and classification purposes from twenty-six (26) active water quality sampling stations in Area 11 during the period 01/01/17 through 12/31/19. Multiple special samples were taken for non-classification purposes, associated with reopening the area following precautionary closures. The samples were collected in 120 ml amber glass bottles, immediately placed on ice and transported to the South Carolina Department of Health and Environmental Control's, Environmental Affairs, Lowcountry – Charleston Laboratory in North Charleston, South Carolina. An additional 120 ml water sample was included with each shipment for the purpose of temperature control. At the laboratory, sample sets exceeding a 30-hour holding time or containing a temperature control in excess of 10 degrees Centigrade were discarded (APHA, 1970).

Surface water temperatures were measured utilizing hand-held, laboratory-quality calibrated centigrade thermometers. Salinity measurements were measured in the laboratory using an automatic temperature compensated refractometer. Additional field data include ambient air temperature, wind direction, tidal stage and date and time of sampling.

## MONITORING RESULTS

Stations 11-06A, 11-11, 11-12, 11-15, 11-16, 11-17, 11-18, 11-27 and 11-35 exceeded a fecal coliform geometric mean MPN value of 14. No Stations exceeded a fecal coliform geometric mean MPN value of 88.

Stations that exceeded a fecal coliform MPN estimated ninetieth percentile value of 43 were 11-01, 11-02A, 11-06, 11-06A, 11-11, 11-12, 11-15, 11-16, 11-17, 11-18, 11-27, 11-32, 11-34, and 11-35. No stations exceeded an estimated ninetieth percentile fecal coliform MPN value of 260. All other stations met Approved criteria.

The 2017 Shellfish season was delayed until October 15, 2017 due to a precautionary closure brought on by Hurricane Irma.

The Charleston Harbor south to the North Edisto River including all areas of Area 12B closed on 2/27/2018 and reopened on 3/20/2018 due to a force main break in the Town of Hollywood's sewer line.

## CONCLUSIONS

During this annual review period three monitoring stations (11-03, 11-05, and 11-22) all have been upgraded to meet the Approved Classification. Based on review of fecal coliform bacteriological data and the pollution source survey, Area 11 appears to be impacted primarily by non-point source pollution.

### NONPOINT SOURCE RUNOFF

Stormwater runoff appears to be the primary route of fecal coliform bacteria contamination into the area. Development of the surrounding upland is occurring along the upper Stono River, between the Limehouse Bridge and Goshen Point, and on the northern half of Kiawah Island, adjacent to Bass and Cinder Creeks. Natural vegetation is often removed from these waterfront properties. Overland runoff from residential outdoor water use could lower water quality by allowing fecal coliform bacteria to be transported more quickly to shellfish harvesting areas.

## RECOMMENDATIONS

Upland shores along the northern part of the Stono River, as well as along Bass Creek, Cinder Creek and Kiawah River all are being heavily developed, bacteriological water quality in Shellfish Management Area 11 (Area 11) appears to be directly affected. Annual water quality oscillations, primarily rainfall-induced, appears to directly affect the Management Area.

Based upon the findings of this report, the following SFMA 11 harvesting classifications are recommended:

### PROHIBITED

1. Those waters of Elliott Cut and Wappoo Creek and all adjacent marshland;
2. Those waters of the Stono River approximately 1,000 feet south and 1,000 feet north of the St. Johns Yacht Harbor;
3. Those waters within approximately 1,000 feet of the Ross Marine facility.

### RESTRICTED

1. Those waters of the Stono River and adjacent marshlands, extending from Station 12B-01 to Station 11-15;
2. Those waters of New Cut Creek and adjacent marshlands, extending from 11-15 to 12A-41;
3. Those waters of Bass Creek and adjacent marshlands, from its headwaters to Station 11-31 at the confluence with the Stono River;

4. Those waters of Cinder Creek and adjacent marshlands, from its headwaters to the confluence with Bass Creek.

**CONDITIONALLY APPROVED**

None

**APPROVED**

All other waters in Area 11.

**Station Additions/Deactivations/Modifications:** None

Analysis of sampling data for Area 11 demonstrates the probability of a significant impact from rainfall exceeding 4.00" in a 24-hour period. Therefore, a precautionary closure of Area 11 will be implemented following rainfall events of greater than 4.00" in a 24-hour period, as measured by the National Weather Service, Southeastern River Forecast Center. This methodology is associated with the concept of the Probable Maximum Precipitation (PMP). PMP estimates for the coastal United States are published in a series of hydro-meteorological reports (HMRs) by the National Weather Service (*National Weather Service*). PMP estimates for South Carolina's growing areas are derived from HMRs 51, 52, and 53 (*National Research Council, 1985*).

## REFERENCES

American Public Health Association, Inc., *Procedures for the Bacteriologic Examination of Sea Water and Shellfish*, 1970, pp. 28-47, *Recommended Procedures for the Examination of Sea Water and Shellfish*, 4th ed., Library of Congress, Washington, D.C.

National Research Council, 1985, "*Safety of Dams - Flood and Earthquake Criteria,"* National Academy Press, Washington DC.

National Shellfish Sanitation Program (NSSP), Guide for the Control of Molluscan Shellfish, 2017 Revision. Model Ordinance. United States Food and Drug Administration.
https://www.fda.gov/media/117080/download

National Weather Service, The National Oceanic and Atmospheric Administration, *Precipitation Frequency Atlas of the Western US: NOAA Atlas II* - Superintendent of Documents, US Government Printing Office, Washington DC.

South Carolina Department of Health and Environmental Control (SCDHEC), Bureau of Water, 2017, Regulation 61-47, Shellfish. p.9-12.
https://www.scdhec.gov/sites/default/files/media/document/R.61-47.pdf

United States Department of Agriculture, Soil Conservation Service, 1971, *Soil Survey of Charleston County, South Carolina.* In cooperation with South Carolina Agricultural Experiment Station and South Carolina Land Resources Conservation Commission, National Cooperative Soil Survey, Washington, D.C. p. 78.

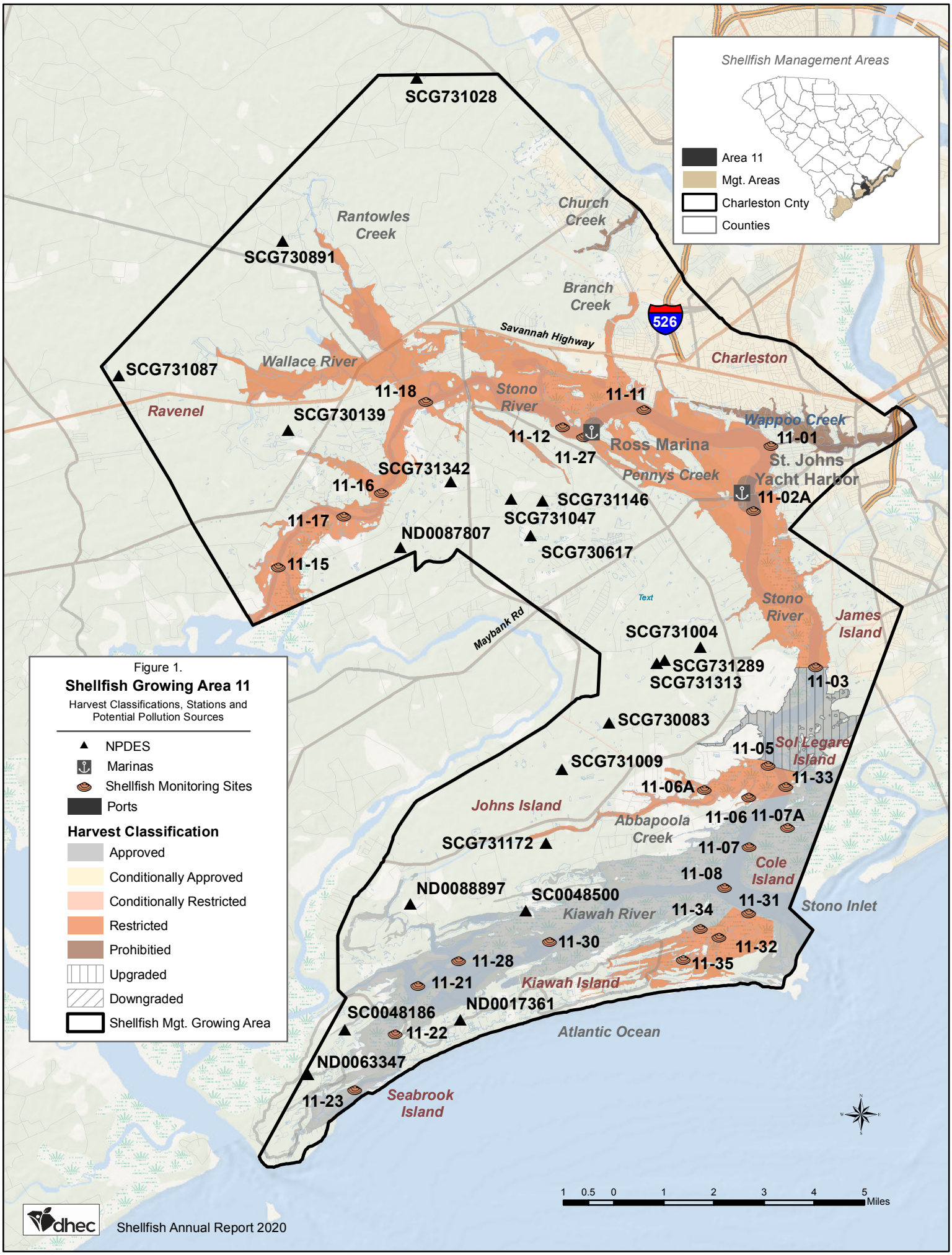
Shellfish Management Areas
Area 11
Mgt. Areas
Charleston Cnty
Counties
SCG731028
SCG730891
SCG731087
SCG730139
SCG731342
SCG731146
SCG731047
SCG730617
ND0087807
SCG731004
SCG731289
SCG731313
SCG730083
SCG731009
SCG731172
ND0088897
SC0048500
ND0017361
SC0048186
ND0063347
11-01
11-02A
11-03
11-05
11-06
11-06A
11-07
11-07A
11-08
11-11
11-12
11-15
11-16
11-17
11-18
11-21
11-22
11-23
11-27
11-28
11-30
11-31
11-32
11-33
11-34
11-35
Rantowles Creek
Church Creek
Branch Creek
Savannah Highway
Wallace River
Ravenel
Stono River
Charleston
Wappoo Creek
Ross Marina
Pennys Creek
St. Johns Yacht Harbor
Maybank Rd
James Island
Sol Legare Island
Johns Island
Abbapoola Creek
Cole Island
Kiawah River
Stono Inlet
Kiawah Island
Atlantic Ocean
Seabrook Island
526
Figure 1.
Shellfish Growing Area 11
Harvest Classifications, Stations and Potential Pollution Sources
NPDES
Marinas
Shellfish Monitoring Sites
Ports
Harvest Classification
Approved
Conditionally Approved
Conditionally Restricted
Restricted
Prohibited
Upgraded
Downgraded
Shellfish Mgt. Growing Area
1 0.5 0 1 2 3 4 5 Miles
dhec
Shellfish Annual Report 2020

**TABLE #1**
**Shellfish Management Area 11**
**Water Quality Sampling Station Descriptions**

| Station | Description |
|---|---|
| 11-01 | Stono River at Elliott's Cut |
| 11-02A | Stono River at southern boundary of St. John's Yacht Harbor marina closure zone |
| 11-03 | Stono River midway between Markers 10 & 11 |
| 11-05 | Stono River at Abbapoola Creek |
| 11-06 | Abbapoola Creek at first large bend |
| 11-06A | Abbapoola Creek at confluence with small creek on west bank at seventh bend |
| 11-07 | Stono River at Green Creek |
| 11-07A | Green Creek, four bends upstream of Station 11-07 |
| 11-08 | Stono River at Kiawah River |
| 11-11 | AIWW at Marker #21A |
| 11-12 | AIWW at Marker #27 |
| 11-15 | AIWW at Marker #63 |
| 11-16 | AIWW at Marker #51 |
| 11-17 | AIWW at Marker #54(Log Bridge Creek) |
| 11-18 | AIWW at Rantowles Creek |
| 11-21 | South Kiawah River on the flats |
| 11-22 | Kiawah River at Mingo Point |
| 11-23 | Kiawah River at Captain Sam's Creek |
| 11-27 | AIWW at Penny Creek near Marker #25 |
| 11-28 | Mullet Hall Creek 300 yards from Kiawah River |
| 11-30 | Kiawah River at Bryans Creek |
| 11-31 | Stono River at Bass Creek |
| 11-32 | Bass Creek at Cinder Creek |
| 11-33 | Stono River at Sol Legare Boat Landing |
| 11-34 | Cinder Creek at 3rd Bend from confluence with Bass Creek |
| 11-35 | Bass Creek at 5th Bend from confluence with Cinder Creek |

(Total Active – 26)

**TABLE #2**

**Shellfish Management Area 11**
**FECAL COLIFORM BACTERIOLOGICAL DATA SUMMARY**
**From Shellfish Water Quality Sampling Stations Between**

**January 1, 2017 and December 31, 2019**

| Station # | 1 | 2A | 3 | 5 | 6 | 6A | 7 | 7A | 8 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLES | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| GEOMEAN | 10.9 | 9.5 | 7 | 5.6 | 12.1 | 22.3 | 2.9 | 3.9 | 3.3 | 19.9 |
| 90TH %ILE | 57 | 48 | 37 | 30 | 73 | 172 | 9 | 16 | 15 | 91 |
| WATER QLTY | R | R | A | A | R | R | A | A | A | R |
| CLASSIFICATION | R | P | R | R | R | R | A | A | A | R |

| Station # | 12 | 15 | 16 | 17 | 18 | 21 | 22 | 23 | 27 | 28 |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLES | 34 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| GEOMEAN | 19.9 | 13.6 | 22 | 14.3 | 37.2 | 4.9 | 6.2 | 3.9 | 14.7 | 3.1 |
| 90TH %ILE | 161 | 58 | 99 | 72 | 219 | 20 | 28 | 16 | 92 | 9 |
| WATER QLTY | R | R | R | R | R | A | A | A | R | A |
| CLASSIFICATION | R | R | R | R | R | A | A | A | P | A |

| Station # | 30 | 31 | 32 | 33 | 34 | 35 |
|---|---|---|---|---|---|---|
| SAMPLES | 34 | 35 | 35 | 35 | 35 | 35 |
| GEOMEAN | 2.8 | 3.8 | 8.7 | 4.8 | 10.8 | 16.2 |
| 90TH %ILE | 8 | 16 | 63 | 28 | 83 | 166 |
| WATER QLTY | A | A | R | A | R | R |
| CLASSIFICATION | A | R | R | R | R | R |

**A** - Approved **CA** - Conditionally Approved **R** - Restricted
**RND** - Restricted/No Depuration **P** – Prohibited

| Table #3<br>Fecal Coliform Historical Trend Sheet<br>Area 11 Stations 90th%ile Values for Annual Updates Related to Rainfall | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Station #** | **2019** | **2018** | **2017** | **2016** | **2015** | **2014** | **2013** | **2012** | **2011** | **2010** | **2009** |
| **11-01** | 57 | 93 | 80 | 69 | 56 | 47 | 49 | 26 | 34 | 39 | 43 |
| **11-02A** | 48 | 64 | 60 | 51 | 51 | 34 | 32 | 14 | 15 | 16 | 19 |
| **11-03** | 37 | 55 | 44 | 23 | 25 | 22 | 18 | 9 | 7 | 10 | 9 |
| **11-05** | 30 | 52 | 39 | 35 | 32 | 34 | 23 | 12 | 13 | 17 | 18 |
| **11-06** | 73 | 145 | 117 | 88 | 48 | 37 | 24 | 14 | 31 | 43 | 46 |
| **11-06A** | 172 | 254 | 279 | 125 | 106 | 81 | 69 | 33 | 53 | 63 | 77 |
| **11-07** | 9 | 14 | 21 | 16 | 13 | 7 | 7 | 5 | 5 | 7 | 9 |
| **11-07A** | 16 | 20 | 20 | 13 | 10 | 8 | 6 | 5 | 7 | 12 | 12 |
| **11-08** | 15 | 35 | 29 | 18 | 9 | 8 | 7 | 4 | 6 | 7 | 7 |
| **11-11** | 91 | 119 | 70 | 51 | 52 | 50 | 50 | 21 | 22 | 19 | 23 |
| **11-12** | 161 | 210 | 106 | 70 | 65 | 58 | 55 | 24 | 30 | 41 | 44 |
| **11-15** | 58 | 72 | 49 | 39 | 40 | 48 | 42 | 32 | 24 | 44 | 45 |
| **11-16** | 99 | 164 | 126 | 115 | 122 | 93 | 79 | 39 | 60 | 77 | 109 |
| **11-17** | 72 | 98 | 91 | 77 | 73 | 53 | 49 | 37 | 35 | 42 | 36 |
| **11-18** | 219 | 258 | 167 | 123 | 124 | 103 | 90 | 52 | 71 | 85 | 75 |
| **11-21** | 20 | 24 | 19 | 18 | 10 | 8 | 11 | 11 | 26 | 26 | 32 |
| **11-22** | 28 | 44 | 37 | 34 | 23 | 16 | 18 | 17 | 39 | 42 | 44 |
| **11-23** | 16 | 24 | 23 | 27 | 18 | 19 | 18 | 17 | 31 | 43 | 46 |
| **11-27** | 92 | 134 | 80 | 80 | 89 | 77 | 61 | 27 | 40 | 49 | 62 |
| **11-28** | 9 | 17 | 13 | 10 | 7 | 6 | 6 | 3 | 19 | 22 | 29 |
| **11-30** | 8 | 11 | 13 | 9 | 8 | 5 | 5 | 3 | 12 | 12 | 16 |
| **11-31** | 16 | 19 | 17 | 15 | 9 | 9 | 7 | 6 | 15 | 21 | 24 |
| **11-32** | 63 | 89 | 58 | 34 | 18 | 23 | 23 | 26 | 66 | 74 | 75 |
| **11-33** | 28 | 38 | 28 | 19 | 14 | 8 | 8 | 5 | 7 | 8 | 8 |
| **11-34** | 83 | 85 | 61 | 47 | 37 | 43 | 34 | 34 | 84 | 98 | 102 |
| **11-35** | 166 | 209 | 162 | 83 | 62 | 72 | 53 | 52 | 138 | 323 | 482 |
| **Annual Rainfall (in inches)** | **49.17** | **58.30** | **61.3** | **45.49** | **64.58** | **56.76** | **48.9** | **27.9** | **37.4** | **50.9** | **60.7** |
| ND = No Data Red = Impaired Water Quality | | | | | | | | | | | |

**TABLE #4**

# WATER QUALITY
# SAMPLING STATIONS DATA

**Shellfish Management Area 11**

Detailed data for each shellfish monitoring station listed in this report's "Fecal Coliform Bacteriological Data Summary Table" and in other shellfish reports, can be obtained by writing South Carolina's Department of Health and Environmental Control – Freedom of Information office at the address below.

Freedom of Information
SC Dept. of Health & Environmental Control
2600 Bull Street
Columbia, SC 29201

Any explanation or clarity needed on the report's content can be obtained by contacting the preparer(s), and/or reviewer(s) listed on the cover page.

**TABLE #5**

# RAINFALL DATA

**Shellfish Management Area 11**

**Source:**

**2017 – 2019 Data**
*National Weather Service - Southeastern River Forecast Center*
*Location: James Island, South Carolina*

**2017 Annual Rainfall Summary**
**Source: National Weather Service - Southeastern River Forecast Center**
**Location: James Island, South Carolina**

| 2017 | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.36 | | | | | | 1.46 | | 0.26 | | | |
| 2 | 0.01 | | 0.12 | | 0.73 | 0.07 | | | 0.69 | | | |
| 3 | 0.2 | | 0.08 | | | 0.01 | 0.01 | 2.42 | 0.41 | | | |
| 4 | 0.2 | | | 0.77 | | | 0.13 | 0.3 | | | | |
| 5 | | | | | 0.36 | 0.02 | | 0.88 | 0.05 | | | |
| 6 | | | | 2.4 | 0.03 | 1.16 | | 0.07 | 0.03 | | | |
| 7 | 0.37 | | | | | 2.11 | | | 1.21 | 0.21 | | 0.31 |
| 8 | | 0.23 | | | | 0.77 | 0.16 | 0.11 | | 0.03 | | 0.85 |
| 9 | | 0.07 | | | | 0.04 | 0.4 | 0.32 | | 0.31 | | 0.83 |
| 10 | | | | | | | 0.24 | 0.6 | | 1.82 | 0.63 | |
| 11 | | | | | | | 1.21 | 0.5 | 0.34 | 0.02 | | |
| 12 | | ND | 0.03 | | | | | ND | *8.06 | 0.06 | | |
| 13 | | | 0.01 | | 0.04 | | | 0.89 | | | | |
| 14 | | | 0.41 | | 0.76 | | | 0.06 | | | | |
| 15 | | | | | | | | 0.66 | | | | |
| 16 | | 0.18 | | | | 0.17 | 0.11 | ND | | | | |
| 17 | | | | | | | 1.66 | ND | | 0.06 | | |
| 18 | | | | | | 0.11 | 0.32 | ND | | | | |
| 19 | | | | 0.26 | | 0.01 | 0.05 | ND | | | | |
| 20 | | | | 0.4 | | 0.03 | 0.72 | ND | | | | |
| 21 | | | | | | 0.43 | 0.14 | 0.02 | | | | 0.34 |
| 22 | 1.45 | | 0.35 | | 0.09 | 0.39 | | ND | 0.13 | | 0.51 | |
| 23 | 1.46 | | | | 1.19 | | | 0.01 | 0.01 | 1.33 | | |
| 24 | 0.06 | | | 0.41 | 3.18 | | 0.09 | | | 0.93 | 0.37 | |
| 25 | | | | 0.89 | 0.29 | 0.42 | 0.87 | 0.47 | | | | |
| 26 | | | | | | 0.32 | 0.27 | 0.65 | | | | |
| 27 | | | | | | | 0.2 | 0.04 | | | | 0.01 |
| 28 | | 0.01 | | | | | | | | | | 0.03 |
| 29 | | | 0.05 | | | | 0.36 | 0.78 | 0.03 | 0.04 | | 0.06 |
| 30 | | | | | | 0.18 | 0.27 | | 0.05 | | | |
| 31 | | | 0.13 | | 0.01 | | | | | | | |
| **Total** | **4.11** | **0.49** | **1.18** | **5.13** | **6.68** | **6.24** | **8.67** | **8.78** | **11.27** | **4.81** | **1.51** | **2.43** |

***Days highlighted indicate 4 or more inches of rain in a 24 hour period. Blank fields indicate no rainfall.**

*** Sample dates are indicated in blue.** | **ND = No Data** | **ANNUAL RAINFALL** | **61.30**

**2018 Annual Rainfall Summary**
**Source: National Weather Service - Southeastern River Forecast Center**
**Location: James Island, South Carolina**

| 2018 | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | 0.12 | 0.27 | 0.42 | | | | |
| 2 | | | | | | | 0.01 | 0.19 | | | 0.07 | 0.97 |
| 3 | | | | | | 0.59 | | 0.53 | 0.08 | | 0.03 | 2.24 |
| 4 | 0.88 | | | | | | 0.76 | 0.76 | | | | 0.01 |
| 5 | | 0.48 | | 0.01 | | | 0.83 | 0.41 | | | 1.23 | |
| 6 | | | | | | | | 0.04 | 0.02 | | 0.27 | |
| 7 | | | 0.24 | | | | 0.25 | | 0.01 | | 0.07 | |
| 8 | | 0.22 | | 0.50 | | 0.03 | 1.08 | | 0.14 | 0.24 | 0.27 | 0.01 |
| 9 | | | | 0.02 | | 1.48 | | 0.13 | 0.09 | 0.43 | 0.01 | 1.17 |
| 10 | | 0.56 | | 0.03 | | 0.20 | | 0.66 | 0.10 | 0.92 | 0.31 | 0.55 |
| 11 | | 0.02 | | 0.10 | | 0.23 | | 0.04 | 0.12 | 0.29 | | |
| 12 | | 0.12 | 0.21 | | | 0.02 | | 0.08 | 0.01 | | | |
| 13 | 0.20 | 0.01 | 0.25 | | | 0.78 | 0.03 | 0.08 | 0.08 | | 1.06 | |
| 14 | | | | | | | 0.15 | 0.03 | | | 0.20 | 1.97 |
| 15 | | | | | 0.01 | 0.08 | 0.01 | 0.36 | 0.24 | | 1.08 | 2.32 |
| 16 | | | | 0.84 | 0.04 | 0.04 | | 0.05 | 0.09 | | | 0.04 |
| 17 | | | | | 0.48 | | 0.22 | 0.01 | 0.06 | | | |
| 18 | | | 0.08 | | 0.05 | | 0.44 | 0.01 | 0.25 | | | |
| 19 | | 0.02 | 0.23 | | 0.93 | | 0.51 | 0.23 | 0.13 | | 0.05 | |
| 20 | | | 0.34 | | 0.37 | | 2.62 | 0.05 | | | | 0.39 |
| 21 | | | 0.33 | | | 0.04 | 0.68 | | 0.01 | 0.16 | | 0.51 |
| 22 | | | | | | | | 0.01 | | | | |
| 23 | 0.33 | | | 0.21 | 0.01 | | 0.15 | | | | | |
| 24 | | 0.02 | | 1.96 | 0.05 | | 1.10 | | 0.08 | | 0.49 | |
| 25 | | | 0.04 | | 0.40 | 1.01 | 0.25 | | | | 0.05 | |
| 26 | | 0.10 | | | | 0.29 | 0.15 | 0.09 | | 0.12 | 0.01 | |
| 27 | | | | | | | 0.44 | 0.10 | | 0.25 | 0.13 | |
| 28 | | | | | 2.43 | 0.10 | 0.47 | 0.09 | 0.20 | | | 0.34 |
| 29 | 0.84 | | | | 0.07 | 0.01 | 0.06 | 0.43 | 0.34 | | | 0.27 |
| 30 | | | | | 0.43 | 0.18 | 1.42 | | 0.39 | | | |
| 31 | | | 0.17 | | 0.20 | | 0.60 | | | | | |
| **Total** | **2.25** | **1.55** | **1.89** | **3.67** | **5.47** | **5.20** | **12.50** | **4.80** | **2.44** | **2.41** | **5.33** | **10.79** |

***Days highlighted indicate 4 or more inches of rain in a 24 hour period. Blank fields indicate no rainfall.**

*** Sample dates are indicated in blue.** | **ND = No Data** | **ANNUAL RAINFALL** | **58.30**

**2019 Annual Rainfall Summary**
**Source: National Weather Service - Southeastern River Forecast Center**
**Location: James Island, South Carolina**

| 2019 | JAN | FEB | MAR | APR | MAY | JUNE | JULY | AUG | SEPT | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 0.04 | 0.01 | | 0.19 | | | 0.68 | | 0.30 | |
| 2 | | | 0.03 | 0.43 | | | | | 0.05 | | | 0.09 |
| 3 | | | 0.01 | 0.23 | | | 0.09 | 0.72 | 0.30 | | | |
| 4 | 0.06 | 0.06 | 0.43 | | 0.04 | | 0.06 | 0.06 | 0.01 | | | |
| 5 | 0.34 | | 0.21 | 0.08 | 0.09 | 0.61 | 0.10 | 0.48 | *4.57 | 0.05 | 0.01 | |
| 6 | | | 0.03 | 0.53 | | 0.20 | 0.79 | 0.06 | *1.17 | 0.03 | 0.14 | |
| 7 | | | | 0.22 | | 1.08 | 0.01 | | | 0.05 | | 0.07 |
| 8 | | | | 0.24 | | 0.66 | 0.15 | 0.01 | | 0.36 | 0.27 | |
| 9 | | | | 0.06 | 0.04 | 0.66 | | 0.01 | | | 0.01 | |
| 10 | | | | 0.53 | 0.03 | 0.21 | 0.34 | 0.06 | | | | |
| 11 | | | 0.02 | 0.08 | | 0.16 | 0.88 | 0.06 | 0.01 | | | |
| 12 | | 0.17 | 0.06 | 0.10 | | 1.48 | | 0.26 | 0.01 | | | |
| 13 | | 0.07 | | 0.01 | 0.38 | 1.87 | | | | | 0.23 | 0.02 |
| 14 | 0.07 | | | | 0.05 | | 0.06 | 0.13 | | 0.12 | | 2.09 |
| 15 | | | | | | | | 1.05 | 0.05 | | 0.55 | 0.02 |
| 16 | | 0.11 | 0.01 | | | | 0.25 | 0.14 | 0.01 | 2.55 | 0.41 | |
| 17 | | 0.04 | 0.01 | | 0.03 | | | 0.47 | | 0.01 | 0.93 | |
| 18 | 0.07 | | | | | 0.07 | 0.18 | 1.53 | 0.01 | | | 0.25 |
| 19 | | 0.01 | | 0.28 | | 0.01 | 0.90 | 0.03 | | 0.02 | | |
| 20 | 0.66 | 0.02 | | 0.36 | | 0.32 | | | | 1.33 | | |
| 21 | | 0.24 | | | | 0.34 | | | | | | |
| 22 | | | | | | 0.12 | | | | 0.02 | | 0.01 |
| 23 | | | | | | 0.46 | 0.07 | 0.06 | | | | 2.27 |
| 24 | 0.49 | | | | | | 1.11 | | | | 0.13 | 2.31 |
| 25 | 0.08 | 0.06 | | | | | | 0.29 | | | | |
| 26 | | | 0.04 | | | | | | | | | |
| 27 | | | | | | | 0.01 | | | 0.07 | | |
| 28 | | 0.01 | | | | 0.04 | | | | 0.12 | | |
| 29 | | | | | | | | 0.27 | | | | |
| 30 | 0.06 | | | | | 0.19 | 0.03 | | | 0.06 | | 0.56 |
| 31 | | | | | | | 0.10 | 0.02 | | | | |
| **Total** | **1.83** | **0.79** | **0.89** | **3.16** | **0.66** | **8.67** | **5.13** | **5.71** | **6.87** | **4.79** | **2.98** | **7.69** |

*Days highlighted indicate 4 or more inches of rain in a 24 hour period. Blank fields indicate no rainfall.

| * Sample dates are indicated in blue. | ND = No Data | ANNUAL RAINFALL | 49.17 |
|---|---|---|---|

**TABLE #6**

**Shellfish Management Area 11**
**Pollution Event Closures**
**2017 – 2019**

| Event | Date(s) | Sample Date(s) | Opening Date | Comments |
|---|---|---|---|---|
| Hurricane Irma | 09/12/2017 | 09/18/2017 | 10/15/2017 | The 2017 Shellfish Harvesting Season was delayed two weeks due to water quality impacts from Hurricane Irma. |
| SSO (Town of Hollywood) | 02/19/2018 | 03/28/2018 | 03/20/2018 | 21-Day Precautionary Closure |
| Hurricane Dorian | 09/05/2019-09/06/2019 | N/A | N/A | 5.74 inches of rain produced during a 2-day period. Open Shellfish Harvesting Season was closed. No summer harvest in Area 11 during this time. |

**TABLE #7**
**Shellfish Management Area 11**
**MARINA INVENTORY**

| Marina | Total Slips/Linear Ft | Pump-out Facility | Fuel Dock |
|---|---|---|---|
| St. Johns Yacht Harbor | 404 Slips | Yes | Diesel-Gas |
| Ross Marine | 1,416 ft | No | Diesel-Gas |